

BIOLOGY

Analysis of Autumn

Autumn crispness brings brisk activity, abundance and beauty to the cities, fields and to the deep woods, prelude to the snows of winter.

By BARBARA TUFTY

See Front Cover

► AUTUMN is a dimming of bright sunlight—a mellowness that comes to the solar rays, a lessening of warmth and intensity.

Autumn comes first in the early mornings and the dew-drenched evenings, with a touch of sharp air that quickens the pulse and livens the step.

Deep in the cities, the shadows fall longer and sooner in the late afternoon against the brick walls, the skyscrapers, the asphalt streets. The steps of men and women become quicker, and their footwear has changed from sandals to dark enclosed shoes. Felt hats replace the straws; seersucker suits and pastel cotton dresses are packed away, while heavier clothes are extracted from their cellophane bags.

The suburbanite cuts the last rose, trims back the garden honeysuckle, and with a sigh of relief puts away his insect sprays. From the gutter swirls and eddies the blue acrid smoke of burning leaves, and the baying of a dog sounds more haunting in the crisp night air.

Corn Husk Tepees

Life on the farms quickens after the sluggish summer of watching for rain or for the right amount of sun. Tepees of empty corn husks stand rustling under a coppery harvest moon, and pumpkins are full and orange.

Farther in the country—in the north woods, by the lakeside or along the mountain ridges—summer homes are cleaned for the last time this year, and boards are nailed

against windows, particularly those facing the lakes, sea or rivers. Water is drained from pipes that might freeze; sailboats, canoes, rowboats, motorboats are dried down and hauled to barns or sheds.

Cups of rodenticide are placed around the house to keep wildlife from gnawing too many candles and matches; and the key is handed over to the year-round caretaker.

Woods Not Silent

The woods are far from silent. There is scurrying, squeaking and racing in the treetops as squirrels and chipmunks follow their aerial highway with nut-filled cheeks to their hollow tree trunk. Along the tree branches gather the birds, squabbling, churning, talking, flying out a few feet only to return to the same branch—all in a fever of excitement that precedes their migration southward.

Far in the sky, the long black lines of the great migrators can still be seen—the Canada goose, ducks and other waterfowl. Some of these birds used to fill the skies in autumn and spring, but so heavy a toll has been taken on their lives that many a hunter has little chance to shoot.

Around the roots of the trees, the porcupines, raccoons and badgers burrow and gnaw the last root or berry for their fattened bodies to survive the winter. The fallen leaves that rattle like paper hide many a bright eye peering from the pointed face of a weasel or a mouse, as they make their last preparations for the long winter nap.

Along the streams, the sleek-coated beavers patch their mud huts over the dammed pond where they will sleep out the frozen winter, snug under the ice. From the quiet

edge of the pond, frogs dive to the chilled bottom and dig themselves under the ooze to lie in suspended sleep in the frozen mud, until spring softens their encasements.

With the first frost has died the gnat, the katydid, the male mosquito. The mayfly has long since left its gossamer empty body on a marsh reed, as have many other fragile insects.

Crickets Lay Eggs

Autumn causes the male praying mantis to mate with the female, who calmly eats her husband, then lays several hundred eggs in a frothy mass that dries like hardened brown foam. The female grasshoppers, locusts and field crickets deposit their tiny eggs in the ground or rotten wood.

Across the fields there blows the fragile traces of a journey—the gossamer threads of spiders which, their summer fulfilled in mating and growing their young, now cast themselves upon the mercy of the wind. They throw themselves bravely to the world, drifting and soaring with the whim of winds to parts unknown—sometimes as far as 200 miles to sea, or as high as 10,000 feet in the sky, or sometimes only as far as the next bramble bush. Tiny ones, no bigger than a mote of dust, rise and fall in the still, sunlit air as if on the great pulse and breath of the world.

Silvery Milkweed Seen

Through the woods, along the roads, over the fields, spreads the rich tapestry of autumn—the goldenrod, the purple and white aster, the cattails ripening their stiff brown tails to silky whiteness and the silvery milkweed. The soft, silky “parachutes” carrying milkweed seeds are shown on this week's front cover. The dull purple flowers seen during the summer have disappeared

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U. S. Fish and Wildlife

FALL MIGRATION—Ducks rest and take off again during their southward migration at the Sacramento Migratory Waterfowl Refuge, California.

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and next year's blooms are winging their way softly to a place in the soil as fall approaches.

This is the season for the aster, a member of the Compositae family of flowers which is the latest plant in evolution. Simple in design as a sun, with its golden center and rays spreading outward, the Compositae flower is the most complicated of all flowers, and the highest developed in the long process of evolution.

It is not the simple blossom it seems, but a complex bouquet of flowers on a single stalk. Each white petal of the daisy, golden petal of the black-eyed Susan, lavender petal of the aster is a flower unto itself—complete with an ovary, stamen, petal and calyx, the basic ingredients that make a flower. And each spike of its center, so closely and tightly packed that they seem like a single pad, is also a complete flower.

Fall Colors in Forests

Another glory of autumn is the flaming autumnal trees of deciduous forests.

These spectacular fall colors are actually limited to forests in only a few regions of the world, with three of the largest lying in the Northern Hemisphere. One is in the British Isles and west central Europe. Another is in eastern China and portions of Japan, and the third is in the eastern part of North America, with portions of this autumn beauty scattered in evergreen forests in the Midwest and North.

In the Southern Hemisphere, the colorful forest pageant is limited to Tasmania and New Zealand only.

A combination of leaf chemistry and the diminution of daylight are the reasons for the change from green to unending blends of scarlet, red, orange, yellow and brown.

As the green chlorophyll is gradually destroyed, other colors already present in the leaves begin to show. The yellow pigments of carotenoids such as xanthophylls display their brightness. This is the pigment seen in carrots, pears, lettuce, lemons, corn, and

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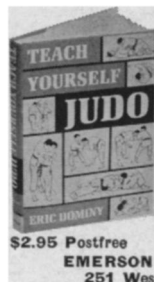
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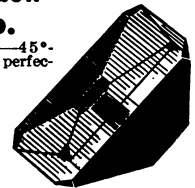
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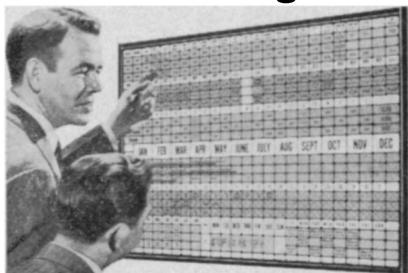
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in the yellows of a buttercup or a marigold. When this chemical is unmixed with others, as with the aspens, birches, tulip trees and the sycamores, the leaves turn a pure translucent yellow.

The red colors are caused by the pigment anthocyanin, which is diffused through the sap. This pigment gives us colors ranging from scarlet through the true reds to the purples and blues—the red beets, raspberries and apples; the purples of the grapes, lavers of the violet and oranges of the persimmon.

Certain trees have more of this anthocyanin in the cell sap—that is why we get the scarlets of maples, sumac and certain oaks. The browns come from pigmentations called tannins, found in walnuts, hazelnuts, wood and dead cells.

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How Leaf Is Severed

As the machinery of the leaves slows down its summer work of converting water, carbon dioxide, soil chemicals and sun energy into materials used for growth and food storage, a remarkable cutting-off mechanism gradually severs the leaf. A double layer of corky cells forms at the base of the leaf stalk where it joins the twig. Little by little this corky layer grows thicker and cuts off the flow of sap.

When it is complete, the pipelines of the leaf are severed, and it takes only a gust of wind, or a shake of the tree to bring down the gentle cargo of color.

Out in space, how does autumn make its mark?

The only change lies in the fact that this whirling mass of rock called earth is now spinning farther from the sun in its orbit. Its poles, tipped at a 23-degree angle, now position it so that the sun's rays are falling perpendicular upon the equator—making the hours of night equal to the hours of day for the brief moment on Sept. 23 at 1:24 p.m. EST, the official beginning of autumn.

• Science News Letter, 84:183 Sept. 21, 1963

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